

# Climate of South Dakota

## Introduction

This publication consists of a narrative that describes some of the principal climatic features and a number of climatological summaries for stations in various geographic regions of the State. The detailed information presented should be sufficient for general use; however, some users may require additional information.

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Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications. These include wind and temperature studies at airports, heating and cooling degree day information for energy studies, and many others. Tabulations produced as by-products of major products often contain information useful for unrelated special problems.

The Means and Extremes of meteorological variables in the Climatography of the U.S. No.20 series are recorded by observers in the cooperative network. The Normals, Means and Extremes in the Local Climatological Data, annuals are computed from observations taken primarily at airports.

The editor of this publication expresses his thanks to those State Climatologists, who, over the years, have made significant and lasting contributions toward the development of this very useful series.

**State and Station Normals are available at:**

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## **Climate of South Dakota**

Topographic Features- Rolling plains are the main feature of South Dakota, varying from nearly level land to hilly ridges. Elevations increase from about 1,500 feet in the east to about 3,000 feet in the west, except in the Black Hills area. The Black Hills, an isolated group of forest-covered mountains, have a climate of their own.

The soil covering the State was laid down in past ages by glaciers, water and wind. There are occasional outcroppings of bedrock. The Missouri River and its tributaries drain all of South Dakota except for a small portion of the northeastern part of the State. Some of this small drainage area is in the headwaters of the Red River of the North in the Hudson Bay Drainage, and the remainder is in the headwater area of the Minnesota River which forms a part of the upper Mississippi River Basin.

South Dakota is bisected by the Missouri River which flows in a southerly direction to Pierre and then turns to the south-southeast where it forms the South Dakota-Nebraska state line. To the west of the Missouri lies a country of canyons, broad, upland flats and buttes. The principal tributaries which drain this region are the: Grand, Moreau and Cheyenne, which drain the Black Hills, and the White. To the east of the Missouri there are numerous small ponds and lakes, some of which dry up in periods of drought. The principal rivers of this area are the: James and Big Sioux. The larger of the two, the James River, has an extremely low slope and consequently is sluggish and meandering. Water falling on much of the eastern area does not reach the stream valleys at all, but lies in depressions until it evaporates or soaks into the ground.

Temperature- Since South Dakota is situated in the heart of the North American Continent, it is near the paths of many cyclones and anticyclones, and has the extreme of summer heat and winter cold that are characteristic of continental climates. The highest temperature of record in the State is 120 degrees Fahrenheit (° F) observed July 5, 1936, at Gannvalley; the lowest, -58° F, February 17, 1936, at McIntosh. Rapid fluctuations in temperature are common. Partly because of the great distance from any large body of water, the ranges of daily, monthly and annual temperatures are very large. Temperatures of 100° F or higher, are experienced in some part of the State each year, and on rare occasions such readings have been noted as early as April and as late as October. These high temperatures are usually attended by low humidity, which greatly reduces the oppressiveness of the heat. Subzero temperatures occur frequently on mid-winter mornings, but it is not often that the temperature stays subzero during the entire day. In the north, subzero temperatures can occur between October and April.

Warm, "Chinook" winds and frequent sunny skies make the Black Hills area the warmest part of the State in the winter. Also, because of the tendency for very cold air to stay at low elevations, some of the arctic air outbreaks that blanket the eastern counties do not reach the higher counties in the west. During the summer, the higher elevation of the Black Hills results in that section having cooler temperatures than the rest of the State. At this season, the central and southeastern

counties are warmest. The freeze-free season is shortest high in the Black Hills where brief freezing has been known to occur at any time of the summer. Elsewhere, the first autumn freeze generally occurs in mid-September in the northwest, in late September in the in the central and east, and the first week in October in the southeast corner. The average last freeze in the spring ranges from early May in the southeast to late May in the northwest.

Precipitation- The annual precipitation decreases northwestward from about 25 inches in the southeast to less than 13 inches in the northwest. The Black Hills are again an exception, varying from 16 inches in their southern portion to almost 25 inches in the northern areas, where rain and snow are often formed when prevailing winds are abruptly forced up the mountainsides. Most of the State's precipitation occurs during the crop season, April through September. On the average, it reaches a maximum during June, and decreases sharply in early July. In the east, there is a small secondary increase in August, followed by an overall diminishing during autumn. The least precipitation is received during winter.

Occasionally there is heavy snowfall in winter and the amount of snow on the ground accumulates to a considerable depth, but as a rule, the snow cover is not great. Wind usually accompanies the snow, causing a large proportion of it to collect in gullies and behind windbreaks. In the worst storms, isolated drifts many feet deep may block roads, while wind-swept fields nearby are nearly bare of snow. Accurate measurements of the snow are difficult since irregularities are introduced by the presence of buildings, fences, trees and weeds; and by variations in the terrain, wind and the snow itself. Snow that falls early in the season seldom stays on the ground very long. After the ground has frozen deeply and the daylight becomes short, it remains longer. Once snow cover is present, there is a tendency for it to continue, since the temperature falls to much lower levels over snow than over bare ground. Snowfall reaches a maximum in February and early March, and decreases markedly. Blizzards are not very frequent, but are a hazard those who are unprepared for a winter storm.

Rainstorms occur most frequently in early summer, hailstorms are most frequent in midsummer, and lightning does its worst damage in late summer. In dry seasons, and particularly in the west in late summer, thunderstorm bases may be as high as two miles above the ground; consequently, the rain may evaporate before reaching the ground. Tornadoes are not uncommon in South Dakota, with an average of 23 reported in a year.

The most serious flooding has been caused by rapid melting of snow pack and aggravated by ice jams. Heavy rainfall alone causes severe floods on tributary streams, especially in the eastern part of the State. Intense local storms result in flash flooding along minor tributaries. The flow of the Missouri River through the State is controlled by Fort Randall and Garrison dams which were constructed for purposes of flood control.

A flood in the Rapid City area during the night of June 9 and the early morning of June 10, 1972 was spawned when six inches or more of rain fell over a six-hour period causing Canyon Lake Dam to fail. There were 236 deaths and over \$150 million (1972 figure) in damage.

Droughts are also fairly common due to the semi-arid environment.

Climate and the Economy- The eastern half of the State has a limy soil, but it is arable, fertile and suitable for growing crops. The western half, because of limited moisture and more rugged terrain, is best suited for stock grazing, although other forms of agriculture are profitable in years of ample moisture. Irrigation is practiced to some extent. Extensive reservoirs have been created along the Missouri River, partly to provide water supplies for irrigation.

There are few, if any, states more dependent upon agriculture than South Dakota. Since grasses flourish in the climate, it is not surprising that livestock and their products account for the greater part of the farm income. Cattle and hogs are the principal livestock, while wheat, corn and oats are the main crops. Hunting is a major recreational activity. Pheasant thrive in the east; antelope, deer and elk, are found in the west. Buffalo are maintained in preserves.